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Sectoral and Cross-Sectoral Integration of Biodiversity in Yemen

Contents

1. Introduction

Yemen reported[1] on environmental policy and strategy; national environmental action plan; the second and the third Five-Year Developmental Plan to 2010; the Poverty Reduction Strategy Paper 2003 – 2005; Vision 2025; Environment and Sustainable Development Investment Programme 2003 – 2008; the National Strategy for Environmental Sustainability (NSES) 2006; Environmental and Sustainable Development Investment Program 2003–2008; Millennium Development Goals (MDGs); national capacity self-assessment; National Adaptation Programme of Action; National Agricultural & Natural Resources Management Policies (PRSP); main relevant sectoral agricultural policies, including plant production policies, seeds and fertilizer production policies, forestry and anti-desertification policies, agriculture research policies, livestock policies, fisheries sector strategy; education and public awareness; genetic resources in Yemen; biotechnology and biosafety.

2. Environmental Policy and Strategy

The government has recognized the importance of integrating environmental issues in the developmental plans. In the recent years significant steps have taken place to enable a more systematic consideration of environmental issues. Provisions have been made in the Environment Protection Law to enable incorporation of environmental aspects and concerns at all stages of the developmental plans. The NEAP acknowledges the inter-relationship of socio-economic developments and sound environmental developments. This NEAP formed the basis for the environmental chapters in the Five Year Development Plan for the period 1996-2000 and for the National Population Strategy and Action Plan for the same period. These plans recognized this approach. These provisions and documents form the basis to integrate environmental concerns in development policies and plans and reflect the commitments and efforts of the country in integration of environmental concerns into developmental plans as being a major item in the country's development agenda. Furthermore this commitment is evident in the government initiative for the development of the Socotra Island with strong commitment for environmental protection and biodiversity conservation of the island.

3. National Environmental Action Plan

The NEAP was issued in mid-1996. The developmental objectives of the plan are based on the national awareness that the wellbeing of the Yemeni people in the present and future generation depends on the nation natural resources base. The plan promotes sustainable use of natural resources through a set of policy options in addressing priority issues.

Environmental issues of national concern were identified and environmental analyses including biodiversity were carried out on the major resource assets and economic sectors; particularly on

[1] Yemen (2009). Assessing Progress towards the 2010 Target - the 4th National CBD Report, Ministry of Water and Environment, Environment Protection Authority, July 2009, 102 pp.

biodiversity and natural habitats, water, land, marine and coastal resources, urban environment, cultural heritage, , oil and energy sector, mining sector and the industrial sectors.

The NEAP promotes sustainable use of natural resources and biodiversity through a set of policy options addressing priority issues. These policy options deal with legislative, institutional, economic and financial measures in addition to information and community involvement.

4. The Second and the third Five-Year Developmental Plan to 2010

Environmental protection strategy in the Second and the Third Five-Year Developmental Plan was based on preserving sustainability of the nation's natural resources and maintenance of ecological system through maintaining a balance between socio-economical growth and available resources.

The plan proposes a number of measures and actions including institutional restructuring, strengthening of natural resources planning and management capacities, establishment and operation of environmental monitoring systems, upgrading of legal frames and information bases, resource mobilization and support participation of relevant agencies, target groups and local communities.

5. The Poverty Reduction Strategy Paper 2003 – 2005

The government acknowledges its commitment towards poverty eradication. This commitment is evident through adaptation of a set of policy actions undertaken since early nineties, such as the economic and financial reform policy and the PRSP. The PRSP acknowledges relationship and linkages between poverty issues and environment protection. The poor are one of the most population groups reliant on environment for their livelihood. As the same time they are the most affected group by environmental problems and the way natural resources are exploited. Also poverty increases pressure on natural resources, though poverty does not necessarily lead to environmental deterioration.

PRSP indicated four major developmental challenges of which two issues, water resources and population problems, have direct linkages with natural resources management practices and relate to carrying capacities of natural recourses. The other two challenges have indirect linkages as they deal with having the right to use natural resources for the benefit of current population without undermining the ability of the future population and of improving institutional structure and efficiencies for sound environmental management.

PRSP aims to reinforce sustainable management of natural resources, mobilize beneficiaries, involve the poor and support the role of women and youth in environmental conservation.

6. Vision 2025

Vision 2025 supports environmental and poverty reduction actions. The vision noted that environmental degradation affects the poor and development. It reviews major environmental problems such as water resources depletion and pollution, degradation of land resources, natural habitat and biodiversity, waste management, over exploitation of natural resources such as fisheries, and urban expansion over agricultural land. In terms of environmental interventions following measures have been proposed:

- Development and implementation of sustainable management and monitoring programmes for water and land resources, agriculture, coastal zone, biodiversity and waste management.
- Development of desertification control programme.
- Provision of energy substitutions.
- Application of environment friendly technologies and enhancement of renewable energy resources.
- Application of environmental impact assessment for developmental projects.
- Enhancement of environmental awareness.

7. Environment and Sustainable Development Investment Programme 2003 – 2008

The plan presents an outline strategy and priority interventions aimed at controlling and gradually reversing environmental impacts. It also aims at supporting sustainable human development for the people of Yemen. 6 main areas of interventions were identified in the plan as follows:

- Habitat and biodiversity conservation
- Sustainable land management
- Sustainable water resources management
- Sustainable waste management
- Sustainable climate change and energy management
- Institutional development / capacity building

Within each programme area, the plan proposes priority actions and budget for each action. The total proposed investment budget is estimated to be US $ 30.2 million.

8. The National Strategy for Environmental Sustainability (NSES) 2006

The National Strategy for Environmental Sustainability (NSES) was completed in 2006 through UNDP's Sustainable Natural Resource Management Programme (SNRMP). The NSES examined the environmental problems in terms of impacting causes, Pressures and Driving Forces and hence suggests strategic framework and action plan for environmental Sustainability. The NSES calls undertaking a numbers of short and medium term interventions to address the following critical environmental issues:

- Water.
- Land resources.
- Biological diversity.
- Coastal and marine environment.
- Waste management.

The NSES attempts to link the effect of environmental degradation on poverty, and seek to investigate means to achieve the Millennium Development Goals (MDGs).

9. Environmental and Sustainable Development Investment Program 2003–2008

The plan presents an outline strategy and priority interventions aimed at controlling and gradually reversing environmental impacts. Six main areas of interventions were identified in the plan. The total proposed investment budget is estimated to be US $ 30.2 million. The six main areas of interventions are:

- Habitat and biodiversity conservation.

- Sustainable land management.
- Sustainable water resources management.
- Sustainable waste management.
- Sustainable climate change and energy management.
- Institutional development/capacity building.

The list depicted in the plan does not reflect priority areas for interventions, but emphasizes areas where some funding was available under ongoing projects

10. Millennium Development Goals (MDGs)

Targeted to integrate the principles of sustainable development into country policies and programs, reverse the loss of environment resources by 2015.

11. National Capacity Self Assessment

NCSA action plan prepared to enable Yemen to fill full its obligation to wards the implementation of the environmental conventions. NCSA primary focus on capacity needs assessments in the three main areas: biodiversity conservation, climate change and desertification, land degradation, particularly in the context of MEAs. The NCSA comes with Action Plan for Environmental Capacity Development which presents an outline strategy and priority interventions to achieve the MEAs goals. Six strategic objective addressing synergistic and conventions specific capacity development intervention areas were revealed during long participatory process undertaken with the related to the environment and natural resources conservation stakeholders, the six areas of interventions are:

- Policy Development and planning.
- Resource mobilization.
- Institutional and legislative strengthening.
- Research and technology development.
- Data and information collection, dissemination and monitoring.
- Rising environmental awareness and education of Yemeni society.
- Sustainable use of natural resources
- Sustainable climate change and energy management

12. National Adaptation Programme of Action

The primary goal of the NAPA process to broadly communicate to the international community priority activities that address Yemen's urgent needs for adapting to the adverse impacts of climate change through:

- Ensuing adequate shareholder representation in the development of NAPA process.
- Identify a comprehensive range of climate change adaptation strategies.
- Establishment of country-driven criteria to evaluate and prioritize adaptation measures.

Make consensus-based recommendations for adaptation activities. And Recommend capacity building and policy, programme and policy institutional integration as part of adaptation priority activities

13. National Agricultural & Natural Resources Management Policies (PRSP) Agriculture

Specific Goal:

Contribute to increasing economic growth; diversification of the base of the economy; and the provision of basic services in order to reduce poverty, which is more widespread in the rural areas, as well as improving efficiency within the sector.

Policies

- Promoting bio-protection and resistance to plant diseases and aphids and supporting
- Giving incentives to the private sector to investing in agriculture production and marketing and to adopt projects outside the densely populated areas, with a view towards creating extensive and diversified job opportunities, in addition to those projects that promote integration between agriculture and industry.

Main relevant Sectoral Agricultural Policies

Plant Production Policies

- Raise the levels of production through achievement of higher yields per unit area.
- Find the compatible environment that will help in the improvement of the conditions and efficiency of rain-fed crop production as well as increasing its returns.
- Promote the cultivation of market-oriented cash crops, in terms of enhancing the efficiency of production techniques used and to market those products that have a comparative advantage.
- The Introduction of modern techniques in rain-fed agriculture that is compatible with the traditional practices.

Seeds and Fertilizer Production Policies

Increase agriculture output through the exploitation of the natural resources by the methods that will lead to conservation of natural resources, and that will ensure their continuity, by means of upgrading the productive capacity of one unit area, quantitatively and qualitatively, with the participation of the beneficiaries to ensure the efficient use of the natural resources available.

- Meet local requirements of improved seeds and appropriate fertilizers.
- Preparation of the regulations for handling agricultural seeds and fertilizers.
- Set up an effective mechanism for coordination among the relevant entities in the production of seeds and fertilizers.
- Vitalize the role of the quality control unit and coordination of its activities in accordance with international and domestic standards in effect.
- Continuation of the research in the production of original breed seeds and drought resistant seeds.
- Provision of technical research information for the beneficiaries.
- Improve technical awareness and training of human resources of the beneficiaries in producing and handling seeds and agricultural fertilizers.
- Support the establishment of specialized associations for the producing and supplying seeds and agricultural fertilizers in the different agricultural regions.

- Upgrade the efficiency of control of fertilizers and seeds at the entry points.

Protection Policies

- Support to the research on protection from agricultural diseases and aphids.
- Activate the agriculture quarantine measures.

Forestry and Anti-Desertification Policies

- Provision of forestry and pasturage seeds and the expansion of rangeland areas and provision of incentives for this.
- Promotion of recreational parks, based on the concept of available social efficiency.
- Expand the establishment and dissemination of natural protected zones and, with a view towards conserving inherited plant assets and protecting the ecological bio-sphere.
- Provision of investment conditions for the private sector that encourage the establishment of health resorts in the range land areas and as a first pilot project to include the planting of mixed forestry trees.
- Development of the legal frameworks by taking advantage of traditional social practices in forestry and range land management.
- Improvement of the management, conservation and development of the existing forests and natural vegetative pasturage areas, and to involve local communities in this respect.
- Support farmers and social institutions to set up windbreaker tree belts and the construction of terraces and water barriers.
- Coordination with non-governmental organizations and the relevant environmental protection agencies through having them support the government efforts to combat desertification of the hinterland, which is threatened by encroaching sands.
- Support activities, at the school, university and social levels for the establishment of vegetative grounds and recreational parks.
- Promote the use of terraces to protect soil from erosion and provide economic benefits, using efficient techniques, in which the government and the communities participate jointly.

Agriculture Research Policies

Agricultural research is important for the achievement of the objectives of agricultural and sustainable development and for directly contributing to increasing agricultural production, and, accordingly, to the alleviation of poverty. Research shall remain a general service of public benefit that the public sector will continue to provide. Accordingly, research programs will be associated with and linked to whatever will serve the implementation of agricultural development and whatever will lead to increasing the efficiency of production, the determination of the priorities of research and concentration on the activities of direct and immediate impact on increasing and improving production through research plans and programs. Agricultural research shall seek to improve production and productivity on sustainable grounds, to develop different varieties of crops, improve livestock production, improve the uses of land and water resources as well as forests and prairies, whereby **agricultural research shall work towards:**

1. Increase productivity of crops through development of improved varieties of farm and garden crops, that would have be adapted to different production systems, as they have been applied, scientifically and practically, to different agricultural environments; .

2. The development of production techniques that are applicable and economically sustainable, and which will lead to reducing the reliance on scarce groundwater and which will help to enhance the efficient use of rainwater.
3. Exploring alternative production methods with emphasis on the conservation and efficient use of water, the development of watersheds and the improvement of water harvesting techniques.
4. Ensure food security at the level of the rural family, especially for cereals and legumes for the small farmers who are dependent on agriculture, and who work in rain-fed system settings and eroded settings; improve the efficiency of farmers and rural women through the development of production systems and techniques that help to provide for stable yields and to process the necessary goods that are required for the rural families.
5. Develop efficient sustainable systems, and an integrated pest control system that is environmentally safe and reduces the reliance on chemical pesticides.
6. Development of improved systems for sustainable and high yielding agriculture, including integrating crop production systems with environmental livestock production systems; and integrating fruit production systems with forestry, and integrating feed production systems with farm systems; with a view towards working towards halting environmental deterioration through the participation of farmers and beneficiary customers.
7. The development of an integrated soil fertilization management process, through the use of a number of options that lead to the increase of production in a sustainable manner and to increase the optimal benefit of the farm resources and agricultural inputs purchased.
8. To improve the free access of small holding families with limited resources to fulfill nutritional requirements, through the development of appropriate techniques that work to improve their purchasing power2 and the production of the appropriate foods in the farm, as well as support the activities of rural women through training.
9. Explore the possibilities of increasing the use of the appropriate drawing animals, manual implements and the effective cost mechanisms that will enhance the efficient use of labor and reduce arduous labor.
10. Increase the abundance and production of natural rangeland pasturage and the vegetative cover, through the participation and rehabilitation of beneficiary users.
11. Improve the productivity of livestock with emphasis on selectivity and proper health care and the improvement of feed resources.
12. Reinforce the dissemination of research efforts without any sexual discrimination, through the development of techniques that are helpful to rural women in improving their incomes and reducing arduous labor.
13. The development and improvement of natural resources for the purpose of achieving better and more efficient use of such resources.
14. The development of techniques for qat and farming that depends on qat , which will help to reduce the use of pesticides and increase the efficient use of water and achieve the optimal productivity per unit of cultivated area used.
15. Reduction of post-harvest losses of farm products through improving the handling and storage techniques, and adding value to such products, as well as the secondary products through the development of storage and processing techniques there for.

16. Development of the techniques for the rapid proliferation of seeds and the vegetative accretion materials, provided that the contribution of The General Authority for Agricultural Research and Extension is output for the relevant institutes, the priority refined seed breeds of farm and garden crops, for the follow-up proliferation of the original seed breeds and the approved seeds of the National Center for Seed Accretion at the farmer's fields; AREA will also participate in inspections of farms during the agricultural season.
17. Improvement of the relationships with the private sector in the areas of reciprocal benefit, such as in training, post harvest techniques, marketing and processing, provision of consultancy that help to solve the problems faced by the private sector.
18. Start on the preparation of a policy on Research in the agriculture sector that will provide guiding signs for the continuing the design of policies for comprehensive economies of production.
19. Reusing the deteriorated land or soil resources and combating desertification for agricultural purposes, with a view towards developing appropriate agricultural systems for the reclaimed land after its use.

Livestock Policies

- Motivation of small farmers to create small enterprises for producing dairy products, and to form associations for assembling milk; and encouragement of the manufacture of dairy products.
- Issue the required legislation for the preservation of animals and livestock by banning the sale of young female livestock, and to set the bottom age limit for slaughtering livestock.
- Activate the animal quarantine in all the entry points to prevent the entry of animal diseases and aphids from these entry points.
- Increase veterinarian services and encourage the private sector to enter this field.
- Increase the production of poultry products through adoption of the essential measures to improve the quality of production, reduce costs, especially feed costs. This could be done by supporting the establishment of companies that produce poultry feed, by the use of the maximum amount of local raw materials available.
- Increase the production of red meat by disseminating and spreading the cultivation of high nutrition feed crops that animals require; and expand on the use of concentrated nutritional supplements.
- Improve livestock extension directed towards rural women, concerning the feeding and care methods in the barns and stables; and spread awareness on the importance of minimum weight requirements before slaughtering, in view of the fact that most animal husbandry is undertaken by rural women and small farmers.
- Direct attention to the Domestic Livestock Breed Improvement Centers by taking advantage of imported breeds to arrive to highly productive breeds.
- Motivation of the private sector to adopt and provide veterinary health services.
- Expand in the dissemination of national campaigns against livestock diseases and aphids.
- Enhance the performance level of and activate internal and external veterinary quarantine.
- Improve the quality of veterinarian technical training and enhance veterinary awareness among breeders and producers.
- Direct attention to grazing areas and to shepherds; and to commence using the concepts of feed units and the spread of such concepts using the public media channels.
- Motivate the cooperative sector in spreading and expanding agriculture and livestock integration and the expansion of livestock producing farms.

Fisheries Sector Strategy:

The general directions of the national strategy for the development of the fisheries sector were prepared from a perception and deep understanding of the importance of the fisheries sector and its role in supporting and developing the national economy. It aims at providing detailed analysis of the current situation and assessment of the magnitude of previous policies and supporting programs provided, the assessment also included topics and major directions for the sector development and preparation of suitable conclusions and recommendations for the future directions and for all potential donor agencies to ensure support to the sector. The assessment will provide to the government and donors clear vision to develop the fisheries sector in the medium and long term prospects. The strategy contains three domains:

The First Domain:

Provides comprehensive explanation on the conducted studies and prospects in research in fisheries and the status of fisheries resources, institutional structure of the fisheries sector.

The Second Domain:

Covers the utilization of fish wealth and maintaining marine monitoring and inspection and quality control and development of fish exports and conserving the marine environment and the proper management of fishing operations.

The Third Domain:

Analysis of the status of infrastructure and major structures of the service and production sectors.

14. Education and Public Awareness

Though the responsibility of environmental education and awareness lies on all institutions dealing with biodiversity, the education and awareness unit of EPA has been the most active. The unit issues Environment Magazine on quarterly basis and actively participates in publishing the environmental page in Al-Thawra daily newspaper through providing environmental news, information and newspaper articles. It also provides the national TV and radio with environmental information and audio-visual materials to produce TV spots, and documentaries programmes when necessary. EPA cooperates with many national partners in producing bulletins and posters and brochures to enhance public awareness in general workshops, environment clubs, school campaigns, and summer camps.

The EPA organize and actively participate in exhibition, campaign and educational activities conducted annually for the celebration of environmental events like world international environmental day, water environmental day, desertification day and Arabs environmental day etc. Annually, EPA organizes meetings to celebrate international day of biological diversity. This event publicizes the knowledge and information on biodiversity through the dissemination of biodiversity's books and brochures to organizations and interested persons.

15. Genetic Resources in Yemen

Yemen is characterized by large diversity of native species, varieties and soil types adapted to different agro-ecological zones. Crops such as wheat, lentil and millet are examples of local varieties whose yield and quality are deteriorating as a result of introducing homogenous high yielding varieties.

Yemen is characterized with rich genetic resources as a result of its rich biodiversity and natural resources base; associated with different climatic conditions and agro-ecosystems. Historically, the ancient people developed traditional practices to preserve the genetic resources. However, in the recent period and due to increased demand for foodstuff, mechanical systems and new alien species were introduced to agricultural practices. There was no efficient and proper attention given to the use of the indigenous genetic resources. There are no breeding programs to improve local strains, collect data, characterize, research and evaluate them.

Sustainable use of agro-biodiversity depends largely on the inherited knowledge and experience and understanding of natural resources. Endogenous genotypes are the result of long selection process by ancient local farmers that were inherited to successive generations. They used indigenous breeding methods for selections for new genotypes to improve species productivity and adaptability to different agro-ecosystems. Examples of such selections were in sorghum, which had been practiced to improve seed's color and size with super early maturation and free of pests. New varieties of sorghum were developed as a result of such processes, which are still widely used in Tihama, Taiz, Ibb and Lahj.

Although Yemen hosts rich biodiversity and genetic resources, and progress made in this respect is minimal compared to other countries that do not have large genetic resources. This had impacted on the productivity of various varieties. For example, the introduction of chicken breeds caused large reduction in local strains. In addition, there have not been any breeding programs to research, evaluate, characterize and improve local strains.

Some research centers use breeding process for species improvement. However most of their activities have been limited to certain varieties such as sorghum, wheat, and onion. Their research work has focused on production of synthetic varieties. An excellent achievement in this respect is improved onion variety called Bafatim, which was developed from mass selection in Syeiun Research Center. This variety was later on released to many regions in the country.

Some genotypes of the endogenous species have excellent unique genetic characterizes. Research need to be done to assess the potentiality of utilizing these resources along with modern knowledge to improve the sustainable use of agro-biodiversity.

Improvement of genetic resources depends of research work and selection of breeding method based on sufficient evaluation process. The academia and research centers have and important role in such research work. Particular roles involve the collection and conservation of genetic materials. The establishment of genetic resources centers in the Faculty of Agriculture of Sana'a is an important step toward genetic resource conservation and assessment in Yemen. These centers have initiated processes

to collect and preserve genetic resources for vegetables, and other crops in order to study genetic behavior of the collected species and their potential for species improvement.

16. Biotechnology and Biosafety

Given that biotechnology and biosafety are relatively new issues in Yemen, there is poor understanding and knowledge on the nature and extent of risks on biodiversity associated with transfer of biotechnology and use of genetically modified organisms (GMOs). Furthermore, there is no specific entity responsible for handling the safe use and transfer of biotechnology and GMOs. There is still a urgent need to develop guidelines for their safe application and to control the impact of the modification operation on human health and agro-biodiversity. These deficiencies, combined with unavailability of policy and legislation framework for regulating biotechnology and biosafety issues, are likely to cause high level of risk on the country fragile ecosystems and its endemic species. Therefore in order to foster this situation and halt any further biodiversity destruction, this national biosafety framework has been developed to regulate their application.

There is however, no legal instrument to regulate use and application of GMOs. There is no research work on GMOs at the national level and no such crops are produced locally. The awareness level is low and presently no authority has been assigned to regulate and research and monitor safe application of biotechnology.

Biotechnology can play an important role in addressing agricultural research and contribute to agricultural development. Presently, there are basic facilities and capacities for biotechnology both at the academia and research centers. Technical capacities and institutional capabilities need to be further improved and public awareness needs to be enhanced. Policies and systems need to be developed and put in place to regulate biotechnology and biosafety. There is a need to develop adequate policies and legal frameworks, as well as on technical, institutional, international cooperation, research and social aspects main issues are as follows:

- On the policy aspects, policies need to be developed to address research work giving due attentions to challenges and priorities, capacity building needs and awareness raising. Due attention should also be given to intellectual property rights and linkages with regional and international efforts.
- On the legal aspects, legal framework, guidelines and instruments for biotechnology and biosafety need to be developed to regulate use and monitor safe applications.
- On the research aspects, there is a need to improve and enhance scientific capacities and technological infrastructure, to research and integrate biotechnology risk management into existing environmental, health, and agricultural regimes. Sufficient funds, incentives and facilities need to be provided
- On the institutional aspects, there is a need to assign an authority to oversee, coordinate, monitor and enforce biotechnology and biosafety issues. Adequate power, facilities and funds need to be provided to effective operation of the agency.
- On the technical level, there is a need to develop technical capacities through capacity development of research and scientific cadre, provision of adequate equipment and facilities and laboratories.

- On the social aspects, targeted awareness programs need to be developed and implemented. Due attention should be given to stakeholders and community participation.
- On international cooperation, mechanisms need to be developed for exchange of experience and linkages with regional and international efforts to ensure biotechnology development, transfer of knowledge and safe and sustainable applications.

On the role of private sector, due attention should be given to the involvement of the private sector who should be encouraged through provision of incentives for creation and financing of local private biotechnology enterprises and promote local public research and development.